

New Species of the Fern Genus *Elaphoglossum* from Mesoamerica

John T. Mickel

New York Botanical Garden, Bronx, New York 10458, U.S.A.

ABSTRACT. Of the 118 species of *Elaphoglossum* treated in the flora of Mesoamerica, 33 were determined to be new and are described here. In addition, one new variety is described and one variety is raised to species rank.

Elaphoglossum is a large and taxonomically difficult genus of wet tropical regions. Fée (1845) and Christ (1899) published major treatments of the genus, treating 105 and 142 species, respectively. Today there are thought to be ca. 600 species. Since the turn of the century many additional collections have been made, but until recently there have been no usable treatments for their identification. While preparing a treatment of *Elaphoglossum* for *Flora Mesoamericana*, a number of previously undescribed species were distinguished. Of 118 species in the flora, 33 species and one variety are new, a figure consistent with the recent regional treatments of Mexico (19 new of 45; Mickel, 1980, 1981, 1988, 1992; Smith, 1975), Venezuela (35 new of 101; Mickel, 1985, 1990b, 1991b), and Peru (51 new of 122; Mickel, 1990a, 1991a). Gradually a clearer understanding is emerging of the genus, the species and species groups, and overall character diversity. Several species complexes remain unresolved, and more collections and detailed studies are needed. Most of the species in *Flora Mesoamericana* (all but 11 of the 118) will be treated also in Lellinger's pteridoflora of Costa Rica–Panama–Chocó, together with illustrations.

***Elaphoglossum andersonii* Mickel, sp. nov.**

TYPE: Costa Rica. San José: near Quebradillas, about 7 km N of Santa María de Dota, Standley 42932 (holotype, US).

Ab *E. hieracioides* frondibus majoribus longius stipitatis textura tenuioribus necnon hydathodiis manifestis abstat.

Epiphytic; rhizome 2–3 mm diam., compact; rhizome scales 3–5 mm long, linear, orange-tan, lustrous, entire; leaves 8–17 cm long, approximate; phylloodia lacking; petiole $\frac{2}{5}$ – $\frac{3}{5}$ the sterile leaf length, tan, flattened; petiole scales 2.5–4 mm long, linear, entire, orange-tan, subulate, spreading, mixed with scattered to dense glandular hairs at petiole base; sterile lamina 4–8 cm long, 1.3–1.7 cm wide, el-

lptic, chartaceous, base cuneate, apex rounded to acute; veins evident, 2 mm apart, at 45–55° angle to costa; hydathodes evident as orange dots; lamina scales 3–4 mm long, scattered, spreading, subulate, hairlike, orange-tan, entire; fertile leaves shorter than the sterile; petiole $\frac{1}{2}$ – $\frac{3}{4}$ the fertile leaf length; fertile lamina elliptic, ca. 2.5 times longer than wide, base and apex rounded; intersporangial scales lacking.

Distribution. Wet forests; 1,500–2,400 m.

Paratypes. COSTA RICA. CARTAGO: Cerro de La Carpintera, Standley 34327 (US). SAN JOSE: Finca La Cima, above Los Lotes, N of El Copey, Standley 42659 (US). PANAMA. CHIRIQUI: Bajo Grande, Cerro Punta, Caballero 178 (US).

This species differs from *E. hieracioides* Mickel in having evident hydathodes, but resembles it in the elongate, longitudinally folded fertile lamina. There seems to be considerable variation in the abundance of glandular hairs, from dense to lacking.

The species is named in honor of William R. Anderson, who completed outstanding studies of *Elaphoglossum* in Hawaii and Jamaica.

***Elaphoglossum atrobarbatum* Mickel, sp. nov.**

TYPE: Panama. Panamá: Cerro Jefe, Valdespino & Aranda 167 (holotype, NY; isotype, UC).

Frondium squamis longissimis capilliformibus nigris necnon frondibus fertilibus abbreviatis praestans.

Epiphytic; rhizome 3–4 mm diam., compact, horizontal; rhizome scales 4–7 mm long, linear, orange-tan, dull, entire, spreading; leaves 7–20 cm long, approximate; phylloodia lacking; petiole $\frac{1}{7}$ – $\frac{2}{5}$ (– $\frac{1}{2}$) the sterile leaf length, tan; petiole scales 4–7 mm long, dense, subulate, hairlike, black, lustrous, denticulate, spreading; sterile lamina 5–14 cm long, 1.4–2.3 cm wide, elliptic to lanceolate, chartaceous, base rounded to broadly cuneate, apex acute; veins obscure, at 65° angle to midrib; hydathodes present; lamina scales 4–8 mm long, black, lustrous, denticulate, spreading; fertile leaf shorter than the sterile; petiole $\frac{2}{3}$ of fertile leaf length; lamina narrowly elliptic, 6–9 mm wide, broadly cuneate, apex acute to obtuse; intersporangial scales 3–8 mm long, hair-

like, subulate, black, lustrous, inconspicuously sparsely denticulate.

Distribution. Wet forests; 100–1,000 m.

Paratypes. PANAMA. CHIRIQUI: ca. 0.5 km E of Cerro Pate Macho, headwaters of Río Palo Alto, *Knapp et al. 2109* (CR). COCLE: Cerro Gaitel above El Valle, *Miller et al. 788* (MO); Comarca de San Blas, Cerro Obu, *Nevers et al. 8082* (MO). PANAMA: Cerro Jefe, *Stimson 5418* (NY), *Tyson 3599* (MO, TTC), *van der Werff & van Hardeveld 6950* (MO, NY, UC), *Porter et al. 5079* (MO), *Folsom 3836* (MO), *Dressler 3164* (TTC), *Valdespino & Aranda 122* (MO), *211* (MO, NY), *220* (MO, NY), *Churchill 3951A* (MO); headwaters of Río Chagres, Río Esperanza, and Río Piedras, *de Nevers 4073* (MO).

Elaphoglossum atrobarbatum is distinguished by the long, black, hairlike lamina scales and short fertile leaves. It resembles *E. lanceiforme* somewhat in lamina shape, but in *E. atrobarbatum* the scales are longer and are black, rather than orange-brown.

The specific epithet comes from the Latin, *ater*, black, and *barba*, beard, referring to the long, black, subulate laminar scales.

Elaphoglossum auripilum* Christ var. *longipilosum Atehortúa, var. nov. TYPE: Costa Rica. Puntarenas: 5 km S of San Vito de Java, Finca Wilson, *Lloyd 4242* (holotype, NY).

A var. *auripilo* fronde sterili linear-lanceolato (nec oblanceolato), stipite dense (nec dissite) squamoso, squamis 3–6 mm longis aurantiacis vel rubro-aurantiacis (nec 1–3 mm brunneo-aurantiaco) divisa.

This variety is most readily distinguished from variety *auripilum* by the more abundant, longer scales on petiole (3–6 mm vs. 1–3 mm long) and lamina (2–3 mm vs. 1.5–2 mm long).

Distribution. Wet forests; 1,000–1,800 m.

Paratypes. COSTA RICA. COCOS ISLAND: *Fournier 351* (NY), *Gómez 3347* (NY). PUNTARENAS: San Vito, Finca Wilson, *Lloyd 4226* (NY), *4227* (NY), *Mickel 3098* (NY), *Seidenschnur 131, 132, 135, 161, 185* (all NY), *McAlpin 85-71* (F), *Raven 21966* (F). SAN JOSE: *Gómez et al. 22964* (MO, NY).

***Elaphoglossum boquetense* Mickel, sp. nov.** TYPE: Panama. Chiriquí: Boquete, Cerro Horqueta, *Dwyer & Hayden 7706* (holotype, NY; isotype, MO).

Ab *E. papillosum* laminae stipitisque squamis aurantiacis distat.

Epiphytic; rhizome 4–5 mm diam., compact, horizontal; rhizome scales 1–2 mm long, linear, black, lustrous, slightly denticulate toward apex; leaves 28–40 cm long, approximate; phylloodia lacking; pet-

iole $\frac{1}{3}$ – $\frac{1}{2}$ of sterile leaf length, tan to brown; petiole scales 1.5–2.5 mm long, sparse, tan (to black at petiole base), entire; sterile lamina 15–25 cm long, 3.4–5 cm wide, elliptic, chartaceous, base attenuate, apex acuminate; veins evident, 2 mm apart, at 60° angle to costa; hydathodes present; lamina scales 2–3 mm long on surface, 3 mm long on margin, scattered on both surfaces, linear, orange-tan, dull, entire; fertile leaf slightly shorter than the sterile; petiole $\frac{3}{5}$ of fertile leaf length; fertile lamina elliptic, base attenuate, apex acute; intersporangial scales ca. 1 mm long, rare, orange-tan, linear, dull.

Distribution. Wet forests; 1,500–1,900 m.

Paratypes. PANAMA. CHIRIQUI: vicinity of Fortuna Dam in valley of Río Chiriquí, *Croat 66563* (MO), *Valdespino 1179* (NY).

This species resembles *E. papillosum* (Baker) Christ in lamina shape and white patches, but is distinct in the scattered, orange, petiolar and laminar scales (rather than sparse, minute, black scales).

***Elaphoglossum brenesii* Mickel, sp. nov.** TYPE: Costa Rica. Puntarenas: 5 km S of San Vito de Java, vicinity of Finca Wilson, *Seidenschnur 180* (holotype, NY).

Ab *E. cuspidato* laminae squamis lanceolatis laxe dispositis, costae squamis angustis pallidis et lamina apice acuta divergens.

Epiphytic; rhizome 3–6 mm diam., compact; rhizome scales 3–6 mm long, linear, dark reddish brown, lustrous, ciliate-denticulate; leaves (10–)17–48 cm long, approximate; phylloodia present, indistinct; petiole $\frac{1}{6}$ – $\frac{1}{2}$ of sterile leaf length, tan to orange; petiole scales 3–7 mm long, dense to scattered, some linear, 3–7 mm long, dark, spreading, most appressed, to 0.5–1 mm long, pale with dark teeth and central streak, lanceolate to orbicular; sterile lamina (8–)13–30 cm long, 1.4–2.5 cm wide, linear-elliptic, chartaceous, base cuneate, apex acuminate; veins obscure, ca. 1 mm apart, at 70° angle to costa; hydathodes lacking; abaxial lamina scales 1–2 mm long, lightly imbricate, some lamina visible, linear-lanceolate, light orange, ciliate-denticulate, with darker point of attachment, costal scales 2–3 mm long, linear, ciliate-denticulate, paler than other laminar scales, with dark teeth and point of attachment, often with dark red-brown lustrous teeth; adaxial scales linear-lanceolate to orbicular, pale orange, costal scales as abaxially; fertile leaves slightly longer than the sterile; petiole $\frac{3}{5}$ of fertile leaf length, usually dark; fertile lamina linear-elliptic, base broadly cuneate to rounded, apex acuminate; costal scales 1–1.5 mm long, pale with reddish brown to black

lustrous point of attachment, linear-lanceolate, appressed; intersporangial scales lacking.

Distribution. Wet forests; 500–2,500 m.

Paratypes. COSTA RICA. ALAJUELA: ca. 20 km N of San Ramón, Moran 3235 (MO); NW end of Finca Los Ensayos, Buena Vista de Zarcero, Judziewicz 4391 (WIS). CARTAGO: La Estrella, Standley 39261 (US); Santa María de Dota, 30 mi. S of Cartago, Stork 2970 (US). GUANACASTE: Parque Rincón de la Vieja, Hacienda Santa María, Herrera 733 (F, MO, UC); Río Chiquito de Tilarán, Haber & Bello 5158 (MO). HEREDIA: Virgen del Socorro–Río Sarapiquí–Cariblanco, Chacón & Herrera 1162 (UC). PUNTARENAS: foothills of the Cordillera de Talamanca, between Agua Caliente and the Río Canasta, Davidse et al. 28348 (MO). SAN JOSE: ca. 7 km N of San Rafael de Heredia on Volcán Barba, Lellinger 662 (MO); Pan Amer. Hwy. to San Isidro de General, Lloyd 4248 (NY). PANAMA. CHIRIQUI: vic. of El Boquete, Maxon 5034 (US); Distrito de Bugaba, road Volcán–Santa Clara, van der Werff & Herrera 7058 (MO). COCLE: El Valle Mesa, 5.6 km along mesa road from main road in El Valle, Folsom 3887 (MO). PANAMA: Distrito Capira, Cerro Campana, van der Werff & Herrera 6214 (MO). VERAGUAS: between Escuela Agrícola Alto Piedra and Río Dos Bocas, Croat 2589a (MO).

Elaphoglossum brenesii is distinct from *E. paleaceum* (Hook. & Grev.) Sledge by the dark red central point of attachment of linear-lanceolate scales on costa and often by round, fringed abaxial scales. The former is similar to *E. cuspidatum* (Willd.) T. Moore in the dark-centered laminar scales, but there are some to many abaxial lanceolate scales, the costal ones often very pale with dark teeth.

The species is named in honor of Alberto M. Brenes, collector of plants in the vicinity of San Ramón, Costa Rica.

***Elaphoglossum brevissimum* Mickel, sp. nov.**

TYPE: Panama. Panamá: Cerro Jefe, Valdespino & Aranda 130 (holotype, NY; isotype, MO).

Ab *E. doanense* frondium fertiliū stipite brevissimo differt.

Epiphytic; rhizome 4–5 mm diam., short-creeping; rhizome scales ca. 5 mm long, linear-lanceolate, tan to dark brown mixed together, lustrous, subentire, with an occasional process; leaves 24–37 cm long, 1–2 mm apart; phyllopodia lacking; petiole $\frac{1}{20}$ – $\frac{1}{15}$ of sterile leaf length, tan; petiole scales 1–3 mm long, sparse, dark, sclerotic, with processes; sterile lamina 22–35 cm long, 3.5–6.2 cm wide, narrowly elliptic, coriaceous, attenuate at both ends; veins obscure, ca. 1 mm apart, at 80° angle to costa; hydathodes lacking; abaxial lamina surface with scattered minute stellate trichomidia, abaxial costa base with a few scattered scales as on petiole, adax-

ially glabrous; fertile leaves much shorter than the sterile ($\frac{1}{2}$ – $\frac{3}{5}$ the length); petiole $\frac{1}{10}$ – $\frac{1}{5}$ the fertile leaf length; fertile lamina 1.2–1.8 cm wide, narrowly elliptic, attenuate at both ends, sparse dark scales on petiole and costa; intersporangial scales lacking.

Distribution. Wet forests; 800–1,000 m.

Paratypes. PANAMA. PANAMA: Cerro Jefe, Dressler 3163a (TTC), 3163b (TTC), Churchill 3952 (MO), Tyson 1001 (TTC), Porter et al. 5078 (MO), Folsom 3833 (MO), Moran 3285 (MO), Croat 43572 (MO), Valdespino et al. 194 (NY, UC).

This species is similar to *E. doanense* Gómez in the sterile leaf size and short petiole, but that species has large, pale, ovate, appressed petiole scales, pale rhizome scales, longer fertile leaves, and no trichomidia.

The name alludes to the very short petiole.

***Elaphoglossum caricifolium* Mickel, sp. nov.**

TYPE: Panama. Chiriquí: Cerro Colorado, 50 km N of San Felix on the Continental Divide, Mori & Dressler 7890 (holotype, NY).

Ab *E. ciliato* (C. Presl) T. Moore lamina lineari, stipite gracili, phyllopodiis brevibus abstans.

Epiphytic, epipetric, or terrestrial; rhizome 1.2–2 mm diam., short- to moderately creeping, resinous, black, or with scales ca. 1 mm long, linear-lanceolate, sclerotic, lustrous brown, entire; leaves 12–42 cm long, approximate to 2 mm apart; phyllopodia 0.3–0.6 cm long; petiole $\frac{1}{10}$ – $\frac{1}{4}$ of sterile leaf length, orange to brown; petiole scales ovate, brown, sclerotic proximally, substellate, orange-tan distally, or lacking, or reduced to resinous dots; sterile lamina 11–35 cm long, 0.5–1.2 cm wide, linear, chartaceous, base and apex attenuate; veins obscure, ca. 1 mm apart, at 65–70° angle to costa; hydathodes lacking; lamina indument adaxially of scales ca. 0.5 mm long, substellate, orange-tan to white with age, more abundant near the margin, abaxial surface with resinous dots, abaxial costa with scattered ovate scales ca. 0.5 mm long; fertile leaves slightly shorter than or equaling the sterile; petiole $\frac{1}{3}$ – $\frac{1}{2}$ the fertile leaf length; fertile lamina 4–7 mm wide, linear, attenuate at base and apex, with scattered orange to black, minute (0.2–0.3 mm long) scales adaxially; intersporangial scales lacking.

Distribution. Wet forests; 1,000–2,000 m.

Paratypes. COSTA RICA. ALAJUELA: Monteverde Reserve, Río Penas Blancas, Bello 979 (MO). GUANACASTE–ALAJUELA: slopes of Miravalles, above Bijagua, Gómez et al. 19159 (MO, UC). PUNTARENAS: valley of Río Cotón between Sitio Cotón and Sitio Tablas, Davidse 24472

(MO); upper slopes of Cerro Burú, *Davidse* 23806 (MO). SAN JOSE: vic. of Santa María de Dota, *Standley* 43452 (US). PANAMA. BOCAS DEL TORO: Oleoducto Road, 2 km NE of Continental Divide, *Churchill et al.* 4934 (MO). CHIRQUI: El Respingo, Cerro Punta, *Chavarría* 38 (US); Fortuna, *Correa et al.* 2179 (US); Cerro Colorado, 50 km N of San Felix on Continental Divide, *Mori & Dressler* 7890 (US); El Boquete, *Cornman* 853 (UC, US); end of road past Palo Alto, ca. 4.5 mi. NE of Boquete, *Hammel* 7358 (MO); Cerro Hornito, *Croat* 67973 (UC); E of main camp at dam site, *Folsom et al.* 5461 (UC); Distrito de Bugaba, Santa Clara, *van der Werff & Herrera* 7172 (MO, NY, UC). VERAGUAS: Cerro Tute, *Thompson et al.* 8850 (MO).

Elaphoglossum caricifolium is distinguished by the slender, naked to resinous-scaly rhizome, linear lamina, and short phylloodia, but is variable in the scaliness of the rhizome and leaf.

The name refers to the sedgelike leaves.

Elaphoglossum caroliae Mickel, sp. nov. TYPE: Costa Rica. Volcán Barba, 7,800 ft., *Lloyd* 4138 (holotype, NY).

Ab *E. smithii* (Baker) Christ lamina latiori basi rotundata differt.

Epiphytic; rhizome 4–6 mm diam., compact; rhizome scales 4–5 mm long, lanceolate, reddish brown to red-orange, lustrous, denticulate, spreading; leaves 10–33 cm long, approximate; phylloodia lacking; petiole $\frac{1}{2}$ – $\frac{2}{3}$ the sterile leaf length, stramineous; petiole scales 3–4 mm long, scattered to dense, lanceolate to subulate, orange, dull, denticulate, spreading; sterile lamina (4–)7–14 cm long, 2–5 cm wide, lanceolate, chartaceous, base rounded, apex caudate; lamina scales ca. 5 mm long on costa, 2–3 mm long on margin, sparse to rare, subulate, orange, dull, spreading; veins evident, 1.5–2 mm apart, at 70° angle to costa; hydathodes present; fertile leaves shorter than the sterile; petiole $\frac{3}{4}$ the fertile leaf length; fertile lamina lanceolate, base rounded, apex acute to mucronate; abaxial costa glabrous or with scales 3–5 mm long, scattered, linear, hairlike; intersporangial scales 2 mm, orange-tan, hairlike, or lacking.

Distribution. Wet forests; 1,200–2,600 m.

Paratypes. COSTA RICA. CARTAGO: La Carpintera, *Torres* 120 (US), *Standley* 34433 (US); Santa Clara de Cartago, *Lankester* 898 (US); San Cristóbal–El Tejar road, *Stork* 2236 (UC). HEREDIA: Cerros de Zurquí, NE of San Isidro, *Standley & Valerio* 50361 (US). SAN JOSE: ca. 10 km N of San Rafael de Heredia on Volcán Barba, *Mickel* 2656 (NY), 2677 (NY), 3023 (NY); Volcán Barba, *Brade* 545 (NY), *Lloyd* 4140b (NY); San Cristóbal road, *Danielson* (Stork no. 2545) (UC, MICH). LIMÓN: Cordillera de Talamanca, Cerros Tararia (Tres Picos),

Davidse et al. 28796A (MO). PANAMA. Cerro Tute, *Thompson et al.* 8850 (MO).

Elaphoglossum caroliae is distinguished by the orange scales of the rhizome and leaf, lustrous laminar surface, and rounded lamina base. There is considerable variation in the abundance of scales on the petiole and lamina, and even among the sporangia.

The species is named in honor of my wife, Carol J. Mickel.

Elaphoglossum christianeae Mickel, sp. nov.

TYPE: Panama. Panamá: 4.5 km N of Lago Cerro Azul by road, *Nee* 7040 (holotype, NY; isotypes, MO, UC).

Rhizomatis squamis elongatis aurantiacis, laminae squamis sparsis dissectis aurantiacis praestans.

Epiphytic, rarely epipetric; rhizome 4–6 mm diam., compact; rhizome scales 7–13 mm long, linear-lanceolate, orange-tan, dull, entire with occasional hairlike processes; leaves 10–32 cm long, approximate; phylloodia present; petiole $\frac{1}{5}$ – $\frac{1}{3}$ (1–3 cm) of sterile leaf length, stramineous to tan; petiole scales 1–2 mm long, scattered, spreading, linear, lacerated with narrow processes, orange to brownish black, dull; sterile lamina 10–29 cm long, 1.4–1.8 cm wide, narrowly elliptic, coriaceous, base attenuate, apex acuminate; veins obscure, ca. 0.8 mm apart, at 75° angle to costa; hydathodes lacking; lamina scales 1 mm, scattered (dense at base) on costa and lamina, deciduous on adaxial surface, highly dissected, substellate, orange, dull; fertile leaves longer or shorter than the sterile; petiole $\frac{1}{3}$ the fertile leaf length; fertile lamina linear-elliptic, $\frac{1}{2}$ as broad as the sterile; intersporangial scales lacking.

Distribution. Wet forests; 0–700 m.

Paratypes. COSTA RICA. PUNTARENAS: Osa Peninsula, 9 km N of Rincón de Osa lumber camp, *Lloyd* 4154 (NY), 4256 (NY); top of ridge just N of OTS station, *Lloyd* 4164 (NY); ridge W of Rincón de Osa, *Seidenschnur* 57b (NY), 60 (NY), 61 (NY); at OTS field station, *Seidenschnur* 103 (NY), 117 (NY); near airfield, ca. 4 mi. W of Rincón de Osa, *Burger & Stolze* 5484 (F). PANAMA. CANAL ZONE: near Madden Dam, *Alston* 8903 (CR). DARIEN: Parque Nacional del Darién, Estación Rancho Frío at N base of Cerro Pirre, *de Nevers et al.* 8262 (MO). PANAMA: Río La Maestra, *Allen* 39 (US).

This species is distinguished by the long, orange rhizome scales and the slender lamina with scattered, orange, highly dissected abaxial scales.

The species is named in honor of Christiane S. Anderson, who made many valuable collections of *Elaphoglossum* in Costa Rica and who co-authored the treatment of that genus for Jamaica.

Elaphoglossum cocosense Mickel, sp. nov.

TYPE: Costa Rica. Iles Cocos, *Pittier* 12359 (holotype, US; isotype, US).

Ab *E. paleaceo* frondibus magnis basi longe attenuatis necnon squamis rhizomatis, stipitis laminaeque magnis, tenuibus et sparsim longidentatis distat.

Epiphytic; rhizome ca. 5 mm diam., compact; rhizome scales 7–12 mm long, linear-lanceolate, orange-tan to blackish, thin, margin with sparse, very long (to 1 mm long) hair-teeth; leaves 37–65 cm long, approximate; phylloodia present; petiole $\frac{1}{10}$ – $\frac{1}{5}$ the sterile leaf length, orange-tan, densely clothed with orange-tan scales 4–8 mm long, sparsely long-hair-toothed; sterile lamina 36–50 cm long, (2.4–)3.0–4.0 cm wide, narrowly oblanceolate, chartaceous, base gradually long-attenuate, apex cuspidate; veins obscure, ca. 1 mm apart, at ca. 70° angle to costa; hydathodes lacking; lamina scales abaxially 3–6 mm long, abundant, imbricate, linear-lanceolate, long hair-toothed, adaxially mostly 2–3 mm long, to glabrescent; fertile leaves not seen.

Distribution. Wet forests; “middle elevation.”

Paratypes. COSTA RICA. COCOS ISLAND: *Gómez* 3327 (CR, F, US), 3362 (CR, NY, US), *Klawe*, 3 Sep. 1967 (US), *Valerio* 1095 (CR).

This resembles *E. paleaceum* in the linear-lanceolate scales on both laminar surfaces, but is distinct in the more dissected blade and petiole scales, the large leaf size, the long-attenuate lamina base, the very long, slender petiole scales, and the rhizome scales thin, only sparsely toothed.

Elaphoglossum coriifolium Mickel, sp. nov.

TYPE: Panama. Chiriquí: Distrito Bugaba, Cerro Punta, *van der Werff & Herrera* 6317 (holotype, MO; isotypes, NY, UC).

Ab *E. lingua* foliis magnis et lamina basi truncata differt.

Epiphytic or terrestrial; rhizome 4–5 mm diam., creeping; rhizome scales 4–6 mm long, lanceolate, dark reddish brown, lustrous, entire; leaves 49–60 cm long, 1–2.5 cm distant; phylloodia present; petiole $\frac{1}{2}$ the leaf length, brown; scales at petiole base 5–10 mm long, scattered, orange, spreading, with hairlike processes, scales distally reduced, obscure, finely skeletonized, appressed; sterile lamina 22–29 cm long, 7–10 cm wide, broadly lanceolate, coriaceous, base truncate to broadly cuneate, apex acute to rounded; veins obscure, 0.7–0.9 mm apart, at 75–80° angle to costa; hydathodes lacking; lamina scales lacking except for minute, stellate, black to dark orange trichomidia; fertile leaves slightly longer

than the sterile; petiole $\frac{3}{4}$ the fertile leaf length; fertile lamina similar in shape to the sterile but $\frac{1}{3}$ – $\frac{1}{2}$ as wide; intersporangial scales lacking.

Distribution. Wet forests; 1,800–2,300 m.

Paratypes. COSTA RICA. SAN JOSE: Desamparados, Frailes, C. Abejonales, *Chavarría & Herrera* 25 (CR, MO). PUNTARENAS: upper Río Burú, *Gómez et al.* 21527 (CR, MO); San Isidro, La Guaba, *Jiménez* 303 (CR); Cerro Chompipe, near Ermita Sta. Cruz, *Lems* 650202 (NY). PANAMA. CHIRIQUI: Monte Azul, 1.4 mi. N of Entre Ríos on E slopes of Cerro Punta, *Antonio* 2724 (MO); above Boquete, on trail to Pate Macho, *McPherson* 1231F (MO); vic. of Guadalupe, between Río Chiriquí Viejo and the Continental Divide, *Churchill & de Nevers* 5054 (MO); Distrito Bugaba, Cerro Punta, *van der Werff & Herrera* 6274 (MO).

Elaphoglossum coriifolium is distinguished by the creeping rhizome, large, strongly coriaceous, truncate blade, and stellate trichomidia. It is related to *E. lingua* (C. Presl) Brackenr. but is the largest form in that complex, resembling it in the roughly ovate or lanceolate, heavily coriaceous lamina, rounded blade apex, fertile leaf longer than the sterile, and small, black, semideciduous rhizome scales.

Antonio 2724 is similar in rhizome diameter and habit and the broadly cuneate blade base but has thinner blade texture, more pointed narrower fertile lamina, and the rhizome scales are not sclerotic. This may represent a distinct taxon.

The specific epithet comes from the Latin, *corium*, leather, and *folia*, leaf, referring to the highly coriaceous leaves.

Elaphoglossum correae Mickel, sp. nov. TYPE:

Costa Rica. Finca La Selva, *Lloyd* 4284 (holotype, NY).

Elaphoglosso producto Rosenstock affinis, sed stipite gracili, lamina lineari-elliptica, fronde fertili iis sterilibus multo breviori, lamina fertili lanceolata, ulterius patria in regione inferiori abstans.

Epiphytic; rhizome 2–4 mm diam., compact; rhizome scales 4–5 mm long, linear, tan at base, blackish at tip, lustrous, subentire, with occasional processes; leaves 18–48 cm long, approximate; phylloodia present; petiole $\frac{1}{8}$ – $\frac{1}{3}$ the sterile leaf length, tan; petiole scales 2 mm long, sparse, blackish, lustrous, linear-lanceolate, spreading, and appressed, scattered, orange trichomidia; sterile lamina 13–36 cm long, 1.2–2.1 cm wide, linear-elliptic, subcoriaceous, attenuate at both ends; veins obscure, 1 mm apart, at 70° angle to costa; hydathodes lacking; laminar scales 0.5–1 mm long, abaxially scattered, linear, hastate or with irregular processes, brown to black, lustrous, especially toward the lam-

ina base and costa, adaxially glabrous; fertile leaves much shorter than the sterile ($\frac{1}{5}$ – $\frac{1}{2}$ the sterile), petiole ca. $\frac{3}{5}$ the fertile leaf length; fertile lamina 1.0–2.1 cm wide, lanceolate, base rounded to truncate, apex acuminate, black scales on petiole and costa as on sterile leaves linear to arachnidoid (spiderlike); intersporangial scales lacking.

Distribution. Wet forests; 80–350 m.

Paratypes. COSTA RICA. ALAJUELA: Cordillera de Tilarán, road between San Ramón and Bajo Rodriguez, *Croat* 68167 (MO), 68183 (MO); Upala, Dos Ríos, 5 km al sur de Brasilia, *Herrera* 1023 (UC). HEREDIA: Cerros Sardinal, *Smith* 1790 (CR, MO, UC). PANAMA. COLON: Santa Rita Ridge Rd., *Sytsma* 1347 (CR). SAN BLAS: Continental Divide along El Llano–Carti Road, Nusagandi, *de Nevers & Pérez* 3711 (MO). PANAMA: Cerro Jefe, *Dressler* 3072 (TTC), 3073 (TTC), *Correa & Dressler* 189 (TTC), 190 (TTC). SAN JOSE ISLAND: *Johnston* 205 (GH).

Elaphoglossum correae is distinguished by the slender sterile leaves and broader, much shorter fertile leaves, tan-based black-tipped rhizome scales, and occurrence at low elevation.

The species is named in honor of Mireya D. Correa A., outstanding taxonomist and teacher in Panama.

***Elaphoglossum croatii* Mickel, sp. nov. TYPE:**

Panama. Chiriquí: Distrito Boquete, Fortuna dam site, *van der Werff & van Hardeveld* 6728 (holotype, NY; isotypes, MO, UC).

Ab *E. bolleyi* stipite gracili, rhizomatis compactioris squamis linearibus abstans.

Epiphytic; rhizome 4–6 mm diam., compact to short-creeping; rhizome scales 3–4 mm long, lanceolate–deltate, dark brown, lustrous, entire; leaves 25–38 cm long, approximate; phylloodia present; petiole $\frac{1}{10}$ – $\frac{1}{5}$ of sterile leaf length, tan to brown; petiole scales 1–3 mm long, sparse, spreading, dark brown, lustrous as on rhizome, and squamules/trichomidia less than 0.5 mm long, round to stellate, appressed, orange to brown; sterile lamina 21–32 cm long, 3.3–4.5 cm wide, elliptic, chartaceous, attenuate at both ends; veins evident, 1–1.5 mm apart, at 80° angle to costa, indistinctly united at margin to form a commissural vein; hydathodes lacking; lamina abaxially with scattered stellate trichomidia, 0.1–0.3 mm long, brown, adaxially glabrous; fertile leaves about equal to or slightly longer than the sterile; petiole ca. $\frac{1}{2}$ of fertile leaf length; fertile lamina 1–2.7 cm wide, narrowly elliptic, attenuate at both ends; intersporangial scales lacking.

Distribution. Wet forests; 800–1,200(–1,700) m.

Paratypes. COSTA RICA. CARTAGO: above San Isidro, *Weber* 6013 (GH). SAN JOSE: ca. 15 km N of Tres Ríos, *Lellinger* 1384 (MICH). PANAMA. BOCAS DEL TORO: Fortuna Dam area, *Churchill* 5862 (MO). CHIRIQUI: Distrito Boquete, Fortuna Dam site, *van der Werff & van Hardeveld* 6693 (UC), *van der Werff* 6888 (MO); NO de Fortuna, *Correa et al.* 2579 (US). COCLE: La Mesa above El Valle, junction with road to Cerro Pilón, *Croat* 25337 (MO).

Elaphoglossum croatii is distinct from *E. latifolium* (Sw.) J. Smith by the presence of dark, entire rhizome scales (also scattered on petiole), the presence of laminar trichomidia, and thinner texture.

This species is named in honor of Thomas B. Croat, exceptional collector of plants in tropical America.

***Elaphoglossum davidsei* Mickel, sp. nov. TYPE:**

Costa Rica. Limón: Valle de Silencio, N of Cerro Hoffman, *Davidse et al.* 28653 (holotype, NY; isotype, MO).

Ab *E. alfredii* rhizomatis squamis deltatis appressis sparsis differt.

Terrestrial, rarely epiphytic; rhizome 2.5–4 mm diam., creeping; rhizome scales mostly 1–1.5 mm long, brown, deltate, dull to somewhat lustrous, entire to short-toothed, appressed; leaves 11–28 cm long, 2–10 mm apart; phylloodia lacking; petiole $\frac{1}{10}$ – $\frac{1}{5}$ the sterile leaf length, tan to brown; petiole scales 0.5–1.5 mm long, deltate to lanceolate, brown, dull, entire, appressed or tips spreading; sterile lamina 9–25 cm long, 1.1–2.1 cm wide, narrowly elliptic, chartaceous; base cuneate, apex attenuate; veins evident, ca. 2 mm apart, at 60° angle to costa; hydathodes present; lamina scales evenly and sparsely distributed on surfaces and margin, lamina also with round punctae 0.1 mm or lanceolate scales 0.8 mm, these dull brown, the longer ones with darker lustrous apex, entire or minutely and sparsely toothed; fertile leaves slightly shorter to slightly longer than the sterile; petiole $\frac{2}{3}$ – $\frac{4}{5}$ the fertile leaf length; fertile lamina 5.5–9 cm long, 1–1.5 cm wide, base broadly cuneate, apex acute to acuminate; adaxial scales 0.1–0.2 mm long, black, lustrous, deltate, intersporangial scales lacking.

Distribution. Wet forests; 2,300–3,100 m.

Paratypes. COSTA RICA. CARTAGO: 16 km SE of El Empalme, *Smith* 2103 (CR, MO, NY, UC); near La Chonta, *Scamman & Holdridge* 8022 (GH, US). LIMÓN: between Río Terbi and Río Sini, *Davidse et al.* 28936 (MO, UC). PUNTARENAS–LIMÓN BORDER: between Cerro Kasir and Cerro Nai, *Davidse et al.* 25843 (CR). SAN JOSE/CARTAGO: 22 km SE of Empalme, *Burger & Liesner* 6489 (US). PANAMA. BOCAS DEL TORO: 2–5 km NW of peak of Cerro Echandí, *Davidse et al.* 25085 (MO), 25479 (MO, UC), *Gómez et al.* 22259 (MO, UC).

Elaphoglossum davidsei is a good match for *E. alfredii* Rosenstock in all dimensions but has rhizome scales that are deltate, appressed, and scattered.

The species is named in honor of Gerrit Davidse, who has made many interesting collections of *Elaphoglossum*.

***Elaphoglossum eximiiforme* Mickel, sp. nov.**

TYPE: Panama. SE slopes of Cerro Echandí, Bocas del Toro, Gómez *et al.* 22284 (holotype, NY; isotype, MO).

Ab *E. eximio* stipite longiori et laminae squamis longioribus crebrioribus diversa.

Epiphytic; rhizome 2–3 mm diam., compact; rhizome scales 4–7 mm long, linear, reddish brown, lustrous, denticulate; leaves 25–33 cm long, approximate; phylloodia lacking; petiole $\frac{1}{3}$ – $\frac{1}{5}$ of sterile leaf length, tan; petiole scales 2–2.5 mm long, scattered, spreading, subulate, orange-tan, lustrous, denticulate, many 3–5-celled hairs also present; sterile lamina 15–22 cm long, 1.1–2.1 cm wide, linear-lanceolate, chartaceous, base broadly cuneate, apex acuminate; veins evident, mostly simple, a few once-forked, 1.2–1.8 mm apart, at 65° angle to costa; hydathodes present; blade scales 2–3 mm long, scattered, ascending, subulate, orange-tan, dull, denticulate; fertile leaves shorter than to nearly equaling the sterile; petiole $\frac{2}{3}$ the fertile leaf length; lamina linear-lanceolate, base broadly cuneate, apex acuminate; intersporangial scales 1.5–2.5 mm long, dense, linear-lanceolate, dark reddish brown, lustrous, denticulate.

Distribution. Wet forests; 1,700–2,400 m.

Paratypes. COSTA RICA. CARTAGO: Volcán de Turrialba, Pittier 7492 (NY, US).

This species differs from *E. eximum* (Mett.) Christ in the longer petiole and longer laminar scales.

***Elaphoglossum fuliginosum* Mickel, sp. nov.**

TYPE: Costa Rica. San José: ca. 3 km NW of Cascajal near the union of the Cascajal and Bajo Maquina rivers, Taylor & Taylor 11339 (holotype, NY).

Ab *E. muscoso* laminae squamis parvis sparsis nigris absimilis.

Epiphytic; rhizome 4–6 mm diam., compact; rhizome scales 5–10 mm long, linear, black to brown, lustrous, subentire, occasionally with slight teeth; leaves 10–30 cm long, approximate; phylloodia present, obscured by dense scales at petiole base;

petiole $\frac{2}{5}$ the sterile leaf length, tan-orange; petiole scales 2–5 mm long, scattered to dense, lanceolate, black, especially the center, distally the petiole scales all black, lustrous, erose, spreading, smaller ones 0.6–1.5 mm long, short-ciliate-denticulate, appressed; sterile lamina 6–17 cm long, 1.8–3.8 cm wide, oblong, coriaceous, base broadly cuneate, apex obtuse; veins obscure, ca. 1 mm apart, at 75° angle to costa; hydathodes lacking; lamina scales 0.7–1.5 mm long, abaxially scattered, appressed, lanceolate, black to mottled black especially near lamina margin, with black cell contents and clear walls, denticulate to short-ciliate, slightly arched, adaxially orbicular, peltate, white, scattered, entire; fertile leaves longer than the sterile; petiole $\frac{3}{4}$ the fertile leaf length; fertile lamina narrowly elliptic, base broadly cuneate, apex acute to obtuse; costal scales ca. 1 mm long, black, appressed, dense; intersporangial scales ca. 1 mm long, scattered, black, lustrous, denticulate.

Distribution. Wet forests; 1,700–2,400 m.

Paratypes. COSTA RICA. CARTAGO: near Empalme, Brown CR-64 (US). LIMÓN: Valle de Silencio, along the Río Terbi, Davidse *et al.* 28783 (CR, MO); ca. 1 km S of El Empalme along Interamerican Hwy., Lellinger 1200 (F). SAN JOSE: ca. 3 km NW of Cascajal, Taylor & Taylor 11338 (US); S of Cartago, ca. 4 km S of El Empalme, near La Chonta, Lellinger 1200 (US), 1604 (US). PROV. UNKNOWN: vic. of Coliblanco, Maxon 281 (NY, US).

Elaphoglossum fuliginosum differs from *E. muscosum* (Sw.) T. Moore by the small, sparse, black laminar scales.

The specific epithet derives from the Latin, *fuligio*, soot, alluding to the black lamina scales.

***Elaphoglossum gloeorrhizum* Mickel, sp. nov.**

TYPE: Costa Rica. Volcán Barba, Lloyd 4140a (holotype, NY).

Rhizomate crasso nudo glutinoso, stipite forti, necnon lamina eximie coriacea notabilis.

Epiphytic, rarely terrestrial; rhizome 5–9 mm diam., short-creeping, resinous, black; rhizome scales lacking; leaves 35–53 cm long, approximate to 5 mm apart; phylloodia 1.5–3(–4) cm long; petiole $\frac{1}{4}$ – $\frac{1}{2}$ of sterile leaf length, orange-tan (to brown), lacking scales but with resinous dots at base, rarely with a few minute (1-mm-long) brown scales near base; sterile lamina 21–40 cm long, 2.3–4.6 cm wide, narrowly elliptic, strongly coriaceous, base cuneate, apex attenuate; veins obscure, 1 mm apart, at ca. 75° angle to costa; hydathodes lacking; lamina glabrous or with very obscure minute dots on abaxial surface; fertile leaves about same length as the sterile

leaves; petiole $\frac{1}{3}$ – $\frac{1}{2}$ of fertile leaf length; fertile lamina 1–3.4 cm wide, narrowly elliptic, base cuneate, apex attenuate, lacking indument.

Distribution. Wet forests; 1,800–2,700 m.

Paratypes. HONDURAS. OCOTEPEQUE: Aldea El Portín, Agua Caliente–Sta. Rosa de Copán, *Croat & Hannon* 63800 (MO). COSTA RICA. LIMÓN: Cordillera de Talamanca, Valle de Silencio, along Río Terbi, *Davidse et al.* 28972 (MO); Cordillera de Talamanca, S side of cordillera between Río Terbi and Río Sini, *Davidse et al.* 28972 (MO); Varablanca, *Lloyd* 4124 (NY); region of Zarcero, *Smith* H104 (F, MO); *Wercklé*, in 1910 (NY, UC).

This species is distinguished by the thick, naked, resinous rhizome, stout petiole, and coriaceous lamina.

The specific epithet derives from the Greek, *gloios*, glue, and *rhiza*, root, for the black, resinous rhizome.

Elaphoglossum grayumii Mickel, sp. nov. **TYPE:** Costa Rica. Puntarenas: 5 km S of San Vito, Finca Wilson, *Mickel* 3066 (holotype, NY).

Ab *E. eximio* hydathodiis nullis, costae squamis fuscis processibus provisis, phylloodiis, necnon lamina fertili basin versus attenuata absimilis.

Epiphytic; rhizome 3–4 mm diam., compact to short-creeping; rhizome scales 1–2 mm long, linear, black, rarely orange-tan, touched with black, lustrous, entire; leaves 32–40 cm long, approximate to 6 mm apart; phylloodia present; petiole less than $\frac{1}{15}$ the sterile leaf length (1–2 cm long), essentially lacking, stramineous to tan; petiole scales at petiole base 1–2 mm long, sparse, appressed, lanceolate to linear, brown to black, lustrous, entire to occasionally toothed, distally with stellate scales to trichomidia less than 0.5 mm long; sterile lamina 30–38 cm long, 1.7–3.0 cm wide, linear-elliptic, coriaceous, base attenuate, apex acuminate; veins obscure, ca. 1 mm apart, at 75° angle to costa, uniting at margin to form commissural vein; hydathodes lacking; scales on costa sparse, linear to lanceolate, black, lustrous, ca. 1 mm long, irregularly lobulate, laminar scales reduced to 0.3–0.8 mm stellate hairs or 0.1 mm punctae; fertile leaves slightly shorter than the sterile; petiole $\frac{1}{5}$ – $\frac{1}{2}$ the fertile leaf length; fertile lamina narrowly elliptic, attenuate at both ends; intersporangial scales lacking.

Distribution. Wet forests; 100–2,000 m.

Paratypes. HONDURAS. Santa Cruz de Yojoa, Cortes, *Edwards* 721 (F). NICARAGUA. ZELAYA: Cerro La Pimienta, *Pipoly* 5243 (CR, UC); Cano El Hormiguero, *Pipoly* 5926 (CR, MO); Costado SW of Cerro El Hormiguero, *Grijalva* 488 (UC, US); ca. 6 km N of Colonia

San Antonio on new road to Colonia San Martín, *Stevens* 9015 (UC). COSTA RICA. ALAJUELA: ca. 20 km SW of San Ramón, *Smith* 2254 (CR, UC); between San Ramón and Bajo Rodriguez, *Croat* 68181 (MO, UC). CARTAGO: SE of bridge over Río Pacuare, *Lent* 670 (F). HEREDIA: Cerros Sardinal, ca. 2–2.5 km N of Chilamate de Sarapiquí, *Smith* 1791 (CR, NY, UC); Finca La Selva, *Grayum* 1964 (NY). LIMÓN: vic. of Guápiles, *Standley* 37070 (US). PUNTARENAS: San Vito, W of Finca Wilson, *Lloyd* 4223 (NY); Osa Peninsula, Tropical Science Center field station, *Seidenschnur* 119 (NY); Boruca, *Ocampo* 1340 (CR). SAN JOSE: basin of El General, *Skutch* 2158 (MO, NY, UC). PANAMA. CANAL ZONE: Barro Colorado Island, *Croat* 10996 (MO). CHIRIQUI: 2.5 km from Questa Piedra along Río Monte Road, *Folsom* 3981 (MO, UC). COCLE: foot of Cerro Pilón, above El Valle de Antón, *Porter et al.* 4666 (MO, NY).

Elaphoglossum grayumii differs from *E. eximium* (Mett.) Christ in lacking hydathodes, and by the presence of dark costal scales (with lateral processes), phylloodia, and fertile lamina attenuate at the base.

The species is named in honor of Michael H. Grayum, collector and student of the Costa Rican flora.

Elaphoglossum heterochroum Mickel, sp. nov. **TYPE:** Costa Rica. Región sureste del Lago Dabagri, *Gómez et al.* 23217 (holotype, NY; isotype, MO).

Inter *E. cuspidatum* et *E. paleaceum* quasi intermedia, a prima stipitis costaeque squamis ad medium nigro-purpureis, laminae squamis lanceolatis arcuatis aurantiacis laxe dispositis diversa.

Epiphytic; rhizome 3–4 mm diam., compact; rhizome scales 4–5 mm long, linear, castaneous, lustrous, margin with sparse stiff cilia often abraded so as to appear entire; leaves 24–35 cm long, approximate; phylloodia present; petiole, $\frac{1}{5}$ – $\frac{1}{3}$ the sterile leaf length, tan to orange; petiole scales 1–3 mm long, dense, spreading, linear-lanceolate, castaneous to black-lustrous, distally on petiole scales with dark center and pale margin, ciliate-denticulate; sterile lamina 18–24 cm long, 1.2–2.1 cm wide, linear-elliptic, coriaceous, base cuneate, apex acuminate; veins obscure, ca. 1 mm apart, at 80–85° angle to costa; hydathodes lacking; lamina scales 1–2 mm long, dense, appressed, lanceolate, pale, dull, ciliate-denticulate, costal scales black-centered, adaxially subimbricate to very sparse or lacking, lanceolate to suborbicular, whitish; fertile leaves longer than the sterile; petiole $\frac{1}{3}$ – $\frac{2}{3}$ the fertile leaf length; fertile lamina linear, base broadly cuneate, apex acuminate; costal scales black, appressed, suborbicular, ciliate-denticulate, adaxially denser than on sterile lamina, suborbicular; intersporangial scales lacking.

Distribution. Wet forests; 600–2,900 m.

Paratypes. COSTA RICA. ALAJUELA: N side of Volcán Arenal, *Lent* 2921 (F); 8 mi. NW of San Ramón on road to Tilarán, *Lloyd* 4194 (NY). CARTAGO: near Río Pejibaye, 2 km SW of Taus, *Lent* 2971 (F). LIMÓN: ridge between Quebrada Camagre and Río Barbilla, *Grayum* 8904 (MO); between headwaters of Río Madre de Dios and Quebrada Barreal, *Grayum* 8802 (MO). HEREDIA: Virgen del Socorro–Río Sarapiquí–Cariblanco, *Chacón & Herrera* 1162 (MO). PUNTARENAS: just N of Santa Elena on Fila Cotón, S of Agua Caliente, *Davidse et al.* 28273 (MO). PANAMA. COCLE: La Mesa above El Valle, *Folsom* 5629 (MO, UC); foot of Cerro Pilón, above El Valle de Antón, *Porter et al.* 4662 (MO, NY); 9.4 km above El Copé, *Croat* 44657 (MO). DARIEN: Pirre Massif, Alturas de Nique, *McPherson* 12202C (MO). PANAMA: Distrito Capira, Cerro Campana, *van der Werff & Herrera* 6214 (NY, UC), *Porter et al.* 4939 (MO, UC).

Elaphoglossum heterochroum resembles both *E. cuspidatum* and *E. paleaceum*, but the scales of the petiole and costa are blackish at the center, the lamina scales are imbricate, lanceolate, orange, and the rhizome scales castaneous. It is close to *E. nigrocostatum* Mickel of Venezuela, but differs in the bicolorous costal and petiolar scales.

The specific epithet comes from the Greek, *heteros*, other, *chroma*, color, referring to the bicolorous petiolar and costal scales.

***Elaphoglossum killipii* Mickel, sp. nov.** TYPE: Costa Rica. San José: vic. of Santa María de Dota, *Standley* 41625 (holotype, US).

Proxime ad *E. longicrurem* accedens, sed frondibus majoribus rhizomatisque squamis bicoloribus absimilis.

Epiphytic; rhizome 2.5–4 mm diam., compact to short-creeping; rhizome scales 2–4 mm long, linear-lanceolate, bicolorous, castaneous to black-centered with orange-tan margin, entire; leaves (14–)26–46 cm long, approximate to 2 mm apart; phylloodia present; petiole $\frac{1}{5}$ – $\frac{1}{3}$ the sterile leaf length, tan; petiole scales 2–4 mm long, abundant, subulate, dark reddish brown, lustrous, denticulate, spreading; sterile lamina 8–19 cm long, 1.8–3.2 cm wide, linear-lanceolate, chartaceous, base broadly cuneate to rounded, apex acuminate; lamina scales 1–5 mm, scattered, hairlike, subulate, dark reddish brown, lustrous, the longer ones on costa and margin, denticulate, spreading; veins evident, 1.5–2 mm apart, at ca. 70° angle to costa; hydathodes present; fertile leaves shorter than the sterile; petiole $\frac{2}{3}$ the fertile leaf length; fertile lamina 6.5–9 cm long, 0.8–11 cm wide, linear to linear-lanceolate, base cuneate, apex acuminate; intersporangial scales 3–5 mm long, abundant, hairlike, orange-tan to dark reddish brown, lustrous, remotely and indistinctly denticulate.

Paratypes. COSTA RICA. PUNTARENAS: valley of the Río Cotón between Sitio Cotón and Sitio Tablas, *Davidse* 24452 (CR, MO); Upper Río Burú, *Gómez et al.* 21487 (MO). SAN JOSE: Quebrada de los Yases, entre La Guaría y Palmilera, Dota, *Jiménez* 1455 (CR, NY); Alto del Sacatal, *Pittier* (herb. no. 10536) (CR). PANAMA. CHIRIQUI: slopes of Cerro de Lino, above El Boquete, *Maxon* 5213 (US); vic. of Boquete, *Cornman* 853 (ARIZ), 895 (ARIZ), 897 (ARIZ), 1014 (ARIZ, US), *Killip* 5180 (US), 5203 (US), *Maxon* 5032 (US); lower slopes of Cerro Pelota, *Knapp* 1491 (CR).

Elaphoglossum killipii closely resembles *E. longicrurem* Christ, differing in its larger size and bicolorous rhizome scales.

The species is named in honor of Ellsworth P. Killip, whose avid collecting has contributed greatly to our knowledge of Central American pteridophytes.

***Elaphoglossum lanceiforme* Mickel, sp. nov.**

TYPE: Costa Rica. Los Angeles de San Ramón, *Brenes* 16141 (holotype, NY).

Ab *E. setoso* (Liebm.) T. Moore lamina lanceolata majori, stipitis laminaeque squamis longioribus, necnon lamina fertili angusta diversa.

Epiphytic; rhizome 2–4 mm diam., compact; rhizome scales 3–5 mm long, linear-lanceolate, dark reddish brown, lustrous, entire, appressed; leaves 11–30 cm long, approximate; phylloodia present; petiole $\frac{1}{3}$ the sterile leaf length, tan; petiole scales 2–4 mm long, abundant, subulate, dark reddish brown, lustrous, denticulate, spreading; sterile lamina 8–19 cm long, 1.8–3.2 cm wide, linear-lanceolate, chartaceous, base broadly cuneate to rounded, apex acuminate; lamina scales 1–5 mm, scattered, hairlike, subulate, dark reddish brown, lustrous, the longer ones on costa and margin, denticulate, spreading; veins evident, 1.5–2 mm apart, at ca. 70° angle to costa; hydathodes present; fertile leaves shorter than the sterile; petiole $\frac{2}{3}$ the fertile leaf length; fertile lamina 6.5–9 cm long, 0.8–11 cm wide, linear to linear-lanceolate, base cuneate, apex acuminate; intersporangial scales 3–5 mm long, abundant, hairlike, orange-tan to dark reddish brown, lustrous, remotely and indistinctly denticulate.

Distribution. Wet forests; 800–1,500(–2000) m.

Paratypes. COSTA RICA. ALAJUELA: ca. 23 km NE of San Ramón, *Taylor* 17846 (NY); 8 mi. NW of San Ramón on road to Tilarán, *Lloyd* 4193 (NY). CARTAGO: Reserva de Tapantí, *Gómez* 18919 (MO, UC). HEREDIA: between Río Peje and Río Sardinalito, *Grayum* 6666 (MO); Laguna del Barva and summit of Volcán Barva, *Grayum & Quesada* 7432 (UC). SAN JOSE: near km 50 along Pan American Hwy., Cerro de la Muerte, *Seidenschnur* 232 (NY); along Río Zurquí, *Smith* 1709 (UC); Alto La Palma, NW of San José, *Moran* 2352 (MO); vic. of La Palma, *Maxon*

Distribution. Wet forests; 1,000–2,000 m.

& Harvey 7907 (US); La Hondua, Standley 3791 (US); Parque Nacional Braulio-Carrillo, Moran 3265 (NY). PUNTARENAS: 5 km S of San Vito, Finca Wilson, Mickel 3132 (NY); Monteverde, Palmer 62 (NY). PANAMA. BOCAS DEL TORO: Fortuna Dam-Chiriquí Grande road, McPherson 6792 (MO). CHIRIQUI: Distrito Boquete, Fortuna Dam site, van der Werff & van Hardeveld 6819 (MO); 0.5 km E of Cerro Pate Macho, Knapp et al. 2109 (MO). PANAMA: Cerro Jefe, Witherspoon 8539 (MO). VERAGUAS: Cerro Tute, Moran 4033 (NY).

Elaphoglossum lanceiforme is closely allied to *E. atrobarbatum* of Panama but the latter has longer, black intersporangial scales rather than subulate orange-tan ones and the lamina apex of the latter tends to be broadly acute rather than narrowly so.

Elaphoglossum lankesteri Mickel, sp. nov.
TYPE: Costa Rica. Heredia: Volcán Barba, Lloyd 4201 (holotype, NY).

Ab *E. latifolium* lamina majori distat.

Epiphytic, less commonly terrestrial; rhizome 5–12 mm diam., compact to short-creeping; rhizome scales 4–8 mm long, linear-lanceolate, dull tan to brown, with occasional lateral processes; leaves 55–90 cm long, approximate to ca. 5 mm apart; phylloodia distinct; petiole usually $\frac{1}{4}$ – $\frac{1}{3}$ the sterile leaf length; petiole scales present only at the base, to 4 mm long, spreading, lanceolate, with occasional processes; sterile lamina 37–60 cm long, 7–11.5 cm wide, elliptic, chartaceous to subcoriaceous, base cuneate, apex acuminate; veins obscure, ca. 1 mm apart, at ca. 80° angle to costa; hydathodes lacking; lamina surfaces glabrous or with brown stellate trichomidia; fertile leaves slightly shorter to slightly longer than the sterile, somewhat narrower; petiole ca. $\frac{1}{2}$ the fertile leaf length; intersporangial scales lacking.

Distribution. Wet forests; (300–)800–2,600 m.

Paratypes. COSTA RICA. ALAJUELA: ca. 20 km NW of San Ramón, Smith 2272 (CR, MO, NY, UC). CARTAGO: El Zanjón, Lankester 645 (US). HEREDIA: Cerro Chompipe, N of San Rafael, Lems 64082908 (NY). LIMÓN: Reserva Indígena Talamanca Sukut, Hammel 17576 (MO). PANAMA. CHIRIQUI: Distrito Boquete, Fortuna Dam site, van der Werff & van Hardeveld 6617 (MO); 2.2 km SW of Cerro Punta, Croat 26307 (MO). PANAMA, COMARCA DE SAN BLAS: Nusagandi, van der Werff 7005 (MO, NY).

This species is distinct from *E. latifolium* by being considerably larger. It is not to be confused with *E. coriifolium* because of *E. lankesteri*'s greater rhizome diameter, cuneate laminar base, more pointed apex, and thinner texture.

The species is named in honor of C. H. Lankester,

who collected many fine plant specimens in Costa Rica.

Elaphoglossum latum (Mickel) Atehortúa ex Mickel, comb. et stat. nov. *Elaphoglossum apodium* (Kaulf.) Schott ex J. Smith var. *latum* Mickel, Amer. Fern J. 69: 100 (1979). TYPE: Guatemala: Steyermark 46369 (holotype, F).

Elaphoglossum lepidothrix Mickel, sp. nov. TYPE: PANAMA. COCLE: La Mesa above El Valle, Croat 25402 (holotype, NY).

Ab *E. muscoso* stipitis squamis linearibus ciliato-denticulatis patulis, laminaeque squamis linearibus ciliato-denticulatis sparsis diversa.

Epiphytic; rhizome 4–8 mm diam., compact; rhizome scales 3–6 mm long, linear with hairlike attenuate apex, reddish brown, lustrous, entire; leaves 12–31 cm long, approximate; phylloodia inconspicuous, covered by scales; petiole $\frac{1}{3}$ – $\frac{1}{2}$ the sterile leaf length, orange-tan; petiole scales 5–8 mm long, spreading, linear, brown to blackish, lustrous, ciliate-denticulate, mixed with 0.5–1 mm understory of orange-tan scales; sterile lamina 8–16 cm long, 3.0–4.3 cm wide, lanceolate-oblong, coriaceous, base broadly cuneate to rounded, apex rounded; veins obscure, ca. 1 mm apart, at 80° angle to costa; hydathodes lacking; lamina scales abaxially 2–3 mm long, linear-lanceolate, orange-tan, ciliate-denticulate, adaxially mostly glabrous, costa occasionally scaly toward base; fertile leaves longer than the sterile; petiole $\frac{1}{3}$ – $\frac{1}{2}$ the fertile leaf length, usually longer than the entire sterile leaf; fertile lamina linear-lanceolate, base rounded, apex obtuse; petiole scales blacker than on sterile leaf, especially distally, costal scales 2 mm long, linear, ciliate-denticulate, intersporangial scales 1 mm long, lanceolate, black-brown, lustrous, ciliate-denticulate, teeth longer than the scale body width.

Distribution. Wet forests; 500–1,300 m.

Paratypes. PANAMA. BOCAS DEL TORO: Oleoducto road, between Ríos Guabo and Guabito, Churchill 5037 (MO). CHIRIQUI: Fortuna Dam area, Churchill et al. 4843 (MO). COCLE: Cerro Pilón, Liesner 782 (MO); 8 km above El Copé, Hammel 787 (CR). DARIEN: Cerro de Garagará, Pittier 5649 (US); SW ridge leading to Alturas de Nique, Hartman 12389 (MO). PANAMA: Valle de Antón, Ocampo 876 (CR); summit of Cerro Campana, Porter et al. 4910 (MO); Cerro Jefe, Witherspoon 8537 (MO).

This species is in the *E. muscosum* complex, but is distinguished by the linear, ciliate-denticulate, spreading petiolar scales.

The specific epithet comes from the Greek, *lepis*, scale, and *trichos*, hair, referring to the very slender scales on petiole and lamina.

Elaphoglossum maculatum Mickel, sp. nov.

TYPE: Panama. Coclé: Cerro Pilón, summit, Dwyer & Lallathin 8959 (holotype, NY).

Ab *E. pygmaeo* frondibus majoribus margine integris, lamina fertili haud decurrenti sporisque cristatis diversa.

Epiphytic; rhizome 1–2 mm diam., horizontal, compact; rhizome scales 1 mm long, linear, hairlike, black, or mixed orange and black scales, strongly indurated, lustrous, grading to dull tan, entire; leaves 4.5–15(–20) cm long, approximate; phyllopodia lacking; petiole $\frac{1}{8}$ – $\frac{1}{4}$ of sterile leaf length, tan; petiole scales 1.5–2 mm long, scattered, ascending to spreading, linear to subulate, orange-tan, to sclerotic, lustrous, dark brown, entire; sterile lamina 3–12 cm long, 0.6–1.9 cm wide, narrowly elliptic, chartaceous, base attenuate, apex acuminate; veins free, 1.5–2 mm apart, at 60° angle to costa; hydathodes present; lamina scales 1–1.5 mm long, sparse on costa, veins, and margin, spreading, subulate, dull, tan to sclerotic but not dark brown, entire to crenulate; fertile leaves longer than the sterile, the petiole $\frac{3}{4}$ – $\frac{4}{5}$ of fertile leaf length, as long as the sterile leaf; fertile lamina narrowly elliptic, base cuneate, apex acute to acuminate; scales present on costa and margin but lacking among sporangia.

Distribution. Wet forests; 0–1,400 m.

Paratypes. PANAMA. COCLE: Alto Calvario, 5.5 mi. N of El Copé, Croat 67549 (MO); vic. of La Mesa, N of El Valle de Antón, Croat 67282 (UC). DARIEN: SW ridge leading to Alturas de Nique, Hartman 12380 (MO); Cerro Pirre, Duke & Elias E-13706 (MO, NY). PANAMA: Rancho Chorro, mts. above Torti Arriba, Folsom et al. 6695 (CR, MO); Cerro Jefe, Churchill 3951B (MO). SAN BLAS: Cerro Brewster, de Nevers 4033 (MO). VERAGUAS: Cerro Tute, Moran 4041 (MO); mts. W of Alto de Piedras Siclo Basico school N of Santa Fe, Hammel 4693 (MO). COLOMBIA. EL VALLE: El Silencio, Yanaconas, Killip & Garcia 33790 (US); Sabaletas, Killip & Cuatrecasas 38756 (US). INTENDENCIA DEL CHOCO: La Concepción, 15 km E of Quibdó, Archer 2083 (US); Río Nuqui, Haught 5499 (US).

This species is closest to *E. pygmaeum* (Mett. ex Kuhn) Christ of Ecuador, which has smaller (4–8 cm long) leaves with crenulate margins, decurrent fertile lamina, and spores spiculate (vs. crested in Panama). *Elaphoglossum maculatum* is variable in the petiole—mostly short to sessile, some stipitate. *Elaphoglossum pygmaeum* has a rhizome less than 1 mm diameter and orange rhizome scales.

The specific epithet comes from the Latin, *maculosus*, spotted, alluding to the white patches on the leaves.

Elaphoglossum micropogon Mickel, sp. nov.

TYPE: Costa Rica. Cartago: Tapantí, ca. 15 km S of Paraíso, Mickel 2369 (holotype, NY).

Ab *E. paleaceo* stipite brevi et lamina fertili lineari differt.

Epiphytic or epipetric; rhizome 3–4 mm diam., compact; rhizome scales 4–6 mm long, linear-lanceolate, dark reddish brown, lustrous, ciliate-denticulate; leaves 30–39 cm long, approximate; phyllopodia present; petiole ca. $\frac{1}{10}$ of sterile leaf length, tan; petiole scales 3–4 mm, dense, spreading, linear-lanceolate, reddish brown to light orange, lustrous to dull, ciliate-denticulate; sterile lamina 24–30 cm long, 1.4–2.7 cm wide, linear-lanceolate, chartaceous, base attenuate to narrowly rounded, apex acuminate; veins obscure, 1 mm apart, at 70° angle to the costa; hydathodes lacking; lamina scales dense, imbricate, abaxially 2–3 mm long, linear-lanceolate, ciliate-denticulate, pale orange; costal scales 2–4 mm long, dark-tipped; adaxially scales 1–2 mm long, linear with 2–4 strongly ascending teeth, scales erect, reddish brown; fertile leaves slightly longer than the sterile; petiole $\frac{1}{3}$ – $\frac{1}{2}$ of the fertile leaf length; fertile lamina 11–14 mm wide, linear; adaxial scales and costal scales dark, arachnidoid (spiderlike), ca. 1 mm long, intersporangial scales 0.1–0.3 mm long, orange-tan, substellate, among the sporangia and hidden by them.

Distribution. Wet forests; 1,000–1,400 m.

Paratypes. COSTA RICA. ALAJUELA: Reserva Monteverde, Río Penas Blancas, Bello 134 (CR). CARTAGO: along tributary of Quebrada Casa Blanca Tapantí, Grayum & Sleeper 3673 (MO); Cañón del Río Grande de Orosí, Chacón et al. 1520 (CR). PUNTARENAS: Monteverde reserve along Río Penas Blancas to small lagoon, Hammel et al. 15408 (MO); Navarro, Wercklé, in 1905 (P). SAN JOSE: 1–4 km N of La Honduras, Lloyd 4111 (NY). PANAMA. CHIRIQUI: between Gualaca and Fortuna Dam site on Río Chiriquí, Croat 49977 (MO); Distr. de Bugaba, along road Volcán–Santa Clara, van der Werff & Herrera 7070 (MO, NY, UC).

This species is similar to *E. auricomum* (Kunze) T. Moore in the short petiole and linear adaxial laminar scales, but that species has skeletonized scales on both laminar surfaces whereas *E. micropogon* has linear-lanceolate scales on the abaxial surface. It is closely allied to *E. paleaceum*, but differs in the linear fertile lamina, short petiole, and linear adaxial scales.

Lloyd 4245 (Costa Rica, San Vito, Finca Wilson, NY) has a rounded lamina base, sterile lamina 4–4.5 cm wide, and fertile lamina ca. 2 cm wide, and may represent a distinct taxon.

The specific epithet comes from the Greek, *miros*, small, and *pogon*, beard, referring to the short, scaly petiole.

***Elaphoglossum mitorrhizum* Mickel, sp. nov.**

TYPE: Costa Rica. Alajuela: 11 km N of San Ramón, Mickel 2961 (holotype, NY).

Ab *E. proximo* rhizomatis squamis bicoloribus (parte centrali nigra saepissime sola persistenti) laminisque utrinque nigropunctatis diversa.

Epiphytic; rhizome 1–1.8 mm diam., long-creeping; rhizome scales 0.5–1 mm long, appressed, lanceolate to deltate, black, lustrous, entire; leaves (5–) 8–16 cm long, 1.5–5 cm distant; phylloodia present; petiole $\frac{1}{3}$ – $\frac{1}{2}$ of sterile leaf length, tan to brown; petiole scales 0.2–1 mm long, lanceolate to round, black to brown, appressed; sterile lamina 3.5–11 cm long, 1.4–4.2 cm wide, ovate-lanceolate, coriaceous, base broadly cuneate, apex acuminate; veins obscure, ca. 1 mm apart, at 75–80° angle to costa; hydathodes lacking; lamina punctate abaxially with round to substellate, black punctae 0.1–0.2 mm long, fewer punctae adaxially; abaxial costa occasionally with sparse, black, reduced, lanceolate, hastate scales; fertile leaves longer than the sterile; petiole $\frac{1}{2}$ – $\frac{3}{4}$ of fertile leaf length; fertile lamina narrowly lanceolate, base broadly cuneate, apex acuminate; scales few, small, black on costa, intersporangial scales lacking.

Distribution. Wet forests; 800–1,500 m.

Paratypes. COSTA RICA. ALAJUELA: ca. 1 km SE of La Balsa de San Ramón, ca. 16 km NW of San Ramón, Smith 2297 (MO, UC), ca. 20 km SW of San Ramón, Smith 2215 (MO, UC). GUANACASTE: Fila del Volcán Cacao, Chacón & Chacón 2291 (MO); Parque Rincón de La Vieja, Herrera 1469 (NY). SAN JOSE: Estación Carrillo, Parque Nacional Braulio Carrillo, Zamora & Elizondo 677 (CR). PANAMA. CHIRIQUI: Distrito Boquete, Fortuna Dam site, van der Werff & van Hardeveld 6811 (MO, UC).

The very slender, long-creeping rhizome with sparse, small, black scales and the abaxial lamina with dark punctae or trichomidia distinguish this species. It has been misinterpreted in most herbaria as *E. proximum* Christ (synonym, *E. bradeorum* Christ), but the type specimen of *E. proximum* has scattered, lustrous, golden scales on the abaxial lamina surface.

The specific epithet comes from the Greek, *mitos*, thread, and *rhiza*, root, referring to the very slender rhizome.

***Elaphoglossum montgomeryi* Mickel, sp. nov.**

TYPE: Costa Rica. Cartago: ca. 22 km E of

Turrialba, above Platanillo, Mickel 3406 (holotype, NY).

Ab *E. lingua* frondium stipite atque costa squamis nigris obsitis differt.

Epiphytic; rhizome 2 mm diam., creeping; rhizome scales ca. 1.5 mm long, black, sclerotic, lustrous, lanceolate, with weak irregular hair-teeth, especially at scale base; leaves 11–18 cm long, ca. 1 cm apart; phylloodia present; petiole ca. $\frac{1}{6}$ the sterile leaf length, light brown; petiole scales 2.5–4 mm long, black, lanceolate to linear-lanceolate, lustrous to dull, with irregular lateral processes; sterile lamina 8–15 long, (2–)3–4.5 cm wide, oblong, coriaceous, base narrowly cuneate, apex rounded; veins obscure, ca. 1 mm apart, at 80° angle to costa; hydathodes lacking; lamina with abaxial costal scales to 3 mm long, as on petiole but reduced, scattered, still more reduced (ca. 1 mm long) on adaxial costa and abaxial lamina surface; fertile leaves far exceeding the sterile; petiole ca. $\frac{1}{2}$ the fertile leaf length; fertile lamina 17 cm long, 1.1 cm wide, base abruptly narrowed, apex rounded; lamina scales including intersporangial scales lacking.

Distribution. Wet forests; 700–1,500 m.

Paratypes. COSTA RICA. CARTAGO: beside Río Pejibaye, 2 km SW of Taus, Lent 2962 (F). LIMÓN: along road 233 between Turrialba and Siquirres, Crosby 2548 (MICH). PANAMA. PANAMA: summit of Cerro Campana, Porter et al. 4944 (MO).

This species is close to *E. lingua* in the creeping rhizome, very dark, sclerotic, small, deltate rhizome scales, and rounded lamina apex, but is distinct from that species by the black scales on the stipe and costa. The petiole scales are linear-lanceolate and conspicuous, 3–5 mm long, with slender lateral processes. The costal scales are slender with proportionally longer processes; abaxially on costa they are 1–2 mm long, becoming as small as 0.2 mm on the lamina surface, with fewer adaxially.

The species is named in honor of James D. Montgomery, collector, friend, and student of *Dryopteris*.

***Elaphoglossum moranii* Mickel, sp. nov. TYPE:**

Costa Rica. Heredia: end of rte. 113 where road crosses Río Patria, Moran 3075 (holotype, NY).

Ab *E. lingua* lamina angustiori differt.

Epiphytic; rhizome 2–3 mm diam., creeping; rhizome scales 0.4–1 mm long, deltate, black, sclerotic, lustrous, entire, appressed, scattered; leaves 13–26(–32) cm long, 2–8 mm apart; phylloodia present; petiole $\frac{1}{4}$ – $\frac{1}{2}$ the sterile leaf length, stramineous to brown, glabrous or with dark stellate trichomidia;

sterile lamina 8–18 cm long, 1.2–2.7(–3.4) cm wide, narrowly oblong, coriaceous, base narrowly cuneate, apex rounded; veins obscure, ca. 1 mm apart, at 60–70° angle to costa; hydathodes lacking; fertile leaves far exceeding the sterile; petiole $\frac{2}{3}$ – $\frac{3}{4}$ the fertile leaf length; fertile lamina 7–12(–30) mm wide, narrower than the sterile; lamina scales lacking.

Distribution. Wet forests; 800–2,500 m.

Paratypes. COSTA RICA. ALAJUELA: along upper Río Sarapiquí, near Cariblanco, *Burger & Antonio* 11128 (F); road between San Ramón and Bajo Rodriguez, *Croat* 68099 (MO); Upala, Bijagua Camino de El Pilón a Río Celeste, *Herrera* 2081 (MO); ca. 20 km N of San Ramón, *Moran* 3229 (NY). GUANACASTE: slopes of Miravalles, above Bijagua, *Gómez et al.* 19153. HEREDIA/SAN JOSE: along Río Para Blanca, Cerro de Zurquí, *Burger et al.* 9308 (F). HEREDIA: Volcán Barba, *Lloyd* 4212 (NY). PANAMA. CHIRIQUI: E of the Fortuna main campsite, *Folsom et al.* 5283 (MO); NO de Fortuna, *Correa et al.* 2234 (US), 2244 (US). COCLE: 8 km above El Copé, *Hammel* 789 (MO).

Elaphoglossum moranii is similar to *E. lingua* in the creeping rhizome and small black sclerotic rhizome scales, but the lamina is more slender (1.2–2.7(–3.4) cm long vs. 2.7–6.5 cm) and the petiole is more slender (ca. 1 mm diam. vs. (1–)1.5–3 mm). It is also similar to *E. longicrure* in lamina shape, but *E. moranii* has a creeping rhizome with small black sclerotic rhizome scales.

The species is named in honor of Robbin C. Moran, fern scholar and coordinator of the Mesoamerican pteridoflora.

***Elaphoglossum ornatiforme* Mickel, sp. nov.**

TYPE: Panama. Veraguas: above Río Primero Brazo, 5 mi. NW of Santa Fe, *Liesner* 966 (holotype, MO).

Elaphoglosso ornato affinis, sed cum ea squamis costalibus multo minoribus grossius dentatis, laminae stipitique pilis erectis glandulosis, necnon lamina apice obtusa basi cuneata incongrua.

Epiphytic; rhizome ca. 5 mm diam., compact; rhizome scales 5–9 mm long, linear-lanceolate to lanceolate, red-orange, dull, with weak hair-teeth; sterile leaves 15–18 cm long, approximate; phylloodia present; petiole $\frac{1}{8}$ – $\frac{1}{5}$ the sterile leaf length, orange-brown; petiole scales 2–3 mm long, dense, lanceolate, orange-brown, dull, coarsely toothed, of uneven lengths and with weak hair tips, spreading, the petiole also bearing erect, glandular hairs; sterile lamina 14–15 cm long, 2.8–3.6 cm wide, narrowly lanceolate, coriaceous, base cuneate, apex obtuse; veins obscure, 1–13 mm apart, at 70° angle to the costa; hydathodes lacking; lamina scales ca. 2 mm long, dense on and limited to costa and margin,

lanceolate, orange-tan, dull, coarsely toothed, spreading, lamina surface bearing erect glandular hairs; fertile leaves longer than the sterile; petiole ca. $\frac{1}{2}$ the fertile leaf length; petiole nearly as long as the sterile leaves; lamina linear-lanceolate, base narrowly cuneate, apex obtuse; scales scattered on costa; intersporangial scales lacking.

Distribution. Wet forests; 700–1,300 m.

Paratypes. PANAMA. DARIEN from Cana up the Cerro Pirre Massif, *Moran* 5050 (US); ca. 6 km S from gold mining camp at Cana up the fila leading W to Alturas de Nique, *Lellinger* 1965 (US).

This species is closely allied to *E. ornatum* but differs in the following: the costal scales are much smaller (ca. 2 mm long, rather than 5–6 mm) and with coarser teeth; lamina and petiole have erect glandular hairs (lacking in *E. ornatum*); the lamina apex is obtuse, not acute, the base is cuneate, not truncate.

***Elaphoglossum pallidiforme* Mickel, sp. nov.**

TYPE: Panama. Panamá: 2.4 mi. beyond Cerro Jefe on road to Altos de Pacora, *Croat* 22656 (holotype, NY; isotypes, MO, UC).

Ab *E. pallido* lamina basi rotundata apice caudata necnon rhizomatis squamis brunneis diversa.

Epiphytic; rhizome 5–8 mm diam., compact; rhizome scales 7–10 mm long, 1.2 mm wide, linear-lanceolate, brown, lustrous, entire; leaves 28–50 cm long, approximate; phylloodia present but short (2–3 mm long), obscured by scales; petiole $\frac{1}{3}$ – $\frac{1}{2}$ of sterile leaf length, orange-brown; petiole totally glabrous; sterile lamina 15–27 cm long, 5.0–6.7 cm wide, lanceolate, chartaceous, base rounded, apex caudate; costa keeled below; lamina glabrous; veins evident, 1.5–2 mm apart, at 70–80° angle to the costa, the vein ends often extended laterally to form a commissural vein; hydathodes lacking; fertile leaves nearly as long as the sterile; petiole nearly $\frac{1}{2}$ the fertile leaf length; fertile lamina linear-lanceolate; intersporangial scales lacking.

Distribution. Wet forests; 600–1,000 m.

Paratypes. COSTA RICA. ALAJUELA: San Carlos, *Jiménez* 919 (F). PUNTARENAS: Boruca, *Ocampo* 1341 (CR). PANAMA. CHIRIQUI: Palo Alto, 4.5 mi. NE of Boquete, *Hammel* 7503 (UC). COCLE: foot of Cerro Pilón, above El Valle de Antón, *Porter et al.* 4670 (MO); Cerro Gaital Caracora, *Dwyer* 8922 (MO). PANAMA: trail to top of Cerro Pelado, *Antonio* 1094 (MO); P. Grande, Santa Fe, *Ocampo* 866 (CR). VERAGUAS: shoulder of Cerro Tuti, *Folsom & Edwards* 3367 (MO).

Elaphoglossum pallidiforme resembles *E. pallidum* (Baker) C. Chr. in the rounded lamina base and obscured phylloodia, but it totally lacks lamina

scales and petiole glands and has laterally extended vein tips. It may be more closely related to *E. albomarginatum* A. R. Smith in the lack of glands and scales and the vein tip extensions, but differs from it in the caudate rather than acuminate lamina apex.

***Elaphoglossum pardalinum* Mickel, sp. nov.**

TYPE: Panama. Chiriquí: above El Boquete, Maxon 5718 (holotype, US).

Ab *E. boragineo* lamina angustiori, stipite breviori, squamisque paucioribus, integris, iis laminae et stipitis fuscis diversa.

Epiphytic; rhizome ca. 6 mm diam., horizontal, compact; rhizome scales 3–5 mm long, linear-deltate, dark reddish brown, lustrous, entire, spreading; leaves 21–35 cm long, approximate; phylloodia lacking; petiole $\frac{1}{6}$ – $\frac{1}{5}$ of sterile leaf length, light brown; petiole scales 3–4 mm long, scattered, linear-deltate, dark reddish brown or with paler margin, lustrous, entire, ascending to spreading; sterile lamina 18–31 cm long, 2.4–4.4 cm wide, narrowly elliptic, chartaceous, base narrowly cuneate, apex acuminate; lamina scales 1–3 mm long, sparse, more on costa, few on margin, linear, castaneous to tan, lustrous to dull, entire, appressed; veins obscure, at ca. 70° angle to costa; hydathodes present; fertile leaf not seen.

Distribution. Wet forests; 1,400–1,700 m.

Known only from the type collection.

Elaphoglossum pardalinum resembles *E. ob lanceolatum* in the oblanceolate lamina with white patches, but is distinct in the smaller, narrower leaves, slightly longer petiole, and more random white patches (not just between the veins).

The specific epithet comes from the Greek, *pardos*, leopard, alluding to the white spots on the lamina.

***Elaphoglossum standleyi* Mickel, sp. nov. TYPE:**

Costa Rica. San José: La Palma, Standley 33224 (holotype, US).

Elaphoglossum omissum simulans, sed stipitis longioris squamis concoloribus laminaeque fertili conduplicata diversa.

Epiphytic; rhizome 3–4 mm diam., compact; rhizome scales 5–7 mm long, linear-lanceolate, orange-tan, lustrous, entire, spreading; leaves 15–35 cm long, approximate; phylloodia lacking; petiole $\frac{1}{5}$ to nearly half the sterile leaf length, stramineous to tan; petiole scales 2–3 mm long, dense, linear-deltate, orange-tan, dull, denticulate, appressed to ascending; sterile lamina 8–18 cm long, 1.2–2.6 cm wide, lanceolate, chartaceous, base broadly cuneate

to rounded, apex acuminate; lamina scales 1–2 mm long, scattered, linear-deltate, tan-orange, lustrous, denticulate, appressed, spreading at margin; veins mostly obscure, 1.5–2 mm apart, at 65° angle to costa; hydathodes present; fertile leaf slightly shorter than the sterile; petiole $\frac{1}{5}$ the fertile leaf length; fertile lamina elliptic, base broadly cuneate, apex obtuse to acute, folded lengthwise; intersporangial scales lacking.

Distribution. Wet forests; 1,500–2,400 m.

Paratypes. COSTA RICA. HEREDIA: Cerro de las Caricias, N of San Isidro, Standley & Valerio 52191 (US), 52198 (US). PUNTARENAS-ALAJUELA BORDER: Monteverde Reserve, Cordillera de Tilarán, Grayum & Sleeper 3840 (CR, MO). SAN JOSE: N fork of Río Zurquí, Cordillera Central, Smith 1652 (UC).

This species resembles *E. omissum* Mickel but has concolorous petiole scales, longer petiole, and longitudinally folded fertile lamina.

The species is named in honor of Paul C. Standley, whose extensive collecting has contributed greatly to our knowledge of Central American pteridophytes.

***Elaphoglossum teleglottis* Mickel, sp. nov.**

TYPE: Panama. Chiriquí: Distrito Bugaba, Cerro Punta, van der Werff & Herrera 6503 (holotype, NY; isotypes, MO, UC).

Ab *E. lloensi* laminae squamis lineari-hastatis diversa.

Epiphytic; rhizome 1–1.3 mm diam., long-creeping; rhizome scales 3–4 mm long, ovate-lanceolate, tan, dull or occasionally with lustrous center, entire, ascending; leaves 13–19 cm long, 3–6 cm apart; phylloodia present; petiole $\frac{1}{3}$ – $\frac{1}{2}$ the sterile leaf length, tan; petiole scales 3–4 mm, scattered, spreading, lanceolate to ovate-lanceolate, tan, dull, entire or with a few processes at base; sterile lamina 8–12 cm long, 2.2–3 cm wide, lanceolate, chartaceous, base narrowly cuneate, apex acuminate; lamina scales orange-brown, abaxially linear-hastate, 4 mm long, with basal processes, to hastate, 1–2 mm long, to linear, 1 mm long, or reduced to punctae; lamina adaxially glabrous; veins evident, 1–1.5 mm apart, at 65–70° angle to costa; hydathodes lacking; fertile leaves longer than the sterile; petiole $\frac{2}{3}$ of fertile leaf length; fertile lamina narrowly lanceolate; intersporangial scales lacking.

Distribution. Cloud forests; 2,200 m.

Known only from the type collection.

This species resembles *E. proximum* Christ but has thinner texture, veins more evident, lamina base more narrowly cuneate, rhizome scales entire (rather than fimbriate) and narrower; lamina scales are hastate rather than fimbriate. *Elaphoglossum mitor*

rhizum differs in having black, appressed rhizome scales 0.5–1 mm long (or larger, tan scales with sclerotic black center) rather than concolorous tan ascending scales 3–4 mm long.

The specific epithet comes from the Greek, *tele*, far, and *glottis*, tongue, referring to the distant leaves on the rhizome.

Elaphoglossum valdespinoi Mickel, sp. nov.

TYPE: Panama. Panamá: Cerro Jefe, *Valdespino* 891 (holotype, NY).

Stipite abbreviato, laminae squamis angustis nigris, nec non lamina fertili linearis notabilis.

Epiphytic; rhizome 4–6 mm diam., horizontal, compact; rhizome scales 5–7 mm long, linear, reddish brown, lustrous, entire, spreading; leaves 12–22 cm long, approximate; phylloodia lacking; petiole $\frac{1}{2}$ – $\frac{1}{8}$ the sterile leaf length, brown; petiole scales 2–3 mm long, sparse, hairlike-subulate, blackish brown, lustrous, denticulate, spreading; sterile lamina 10–20 cm long, 1.4–2.3 cm wide, narrowly elliptic, chartaceous, base cuneate, apex acute to acuminate; veins obscure, ca. 1.5 mm apart, at 65° angle to costa; hydathodes present; lamina scales scattered, as on petiole, lustrous, 3–6 mm long on costa, 2–4 mm long elsewhere, minutely denticulate, spreading; fertile leaves equal to or slightly longer than the sterile; petiole $\frac{1}{2}$ the fertile leaf length; fertile lamina 5 mm wide, linear, base attenuate, apex obtuse; intersporangial scales 4–6 mm long, dark reddish brown to black.

Distribution. Cloud forests; 100–900 m.

Paratypes. PANAMA. CHIRIQUI: Distrito Boquete, Fortuna Dam site, *van der Werff & van Hardeveld* 6808 (UC). PANAMA: Cerro Jefe, *Sytsma et al.* 1426 (CR, MO), 2456 (MO), *Porter, et al.* 5081 (MO), *Tyson* 3404 (MO).

This species is distinguished by its short petiole, long, narrow, black laminar scales, and linear fertile lamina.

The species is named in honor of Iván A. Valdespino, outstanding collector of Panamanian pteridophytes and student of American *Selaginella*.

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Literature Cited

Christ, H. 1899. Monographie des Genus *Elaphoglossum*. Denkschr. Schweiz. Naturf. Ges. 36: 1–159.

Fée, A. L. A. 1845. Mémoires sur les familles des fougères. 2: 1–114, pl. 1–64.

Mickel, J. T. 1980. Nine new species of *Elaphoglossum* (Elaphoglossaceae) from Mexico. Brittonia 32: 334–339.

—. 1981. *Elaphoglossum*. Pp. 104–116 in D. E. Breedlove (editor), Flora of Chiapas. 2. Pteridophytes, by A. R. Smith. Calif. Acad. Sci.

—. 1985. *Elaphoglossum*. Pp. 78–107 in A. R. Smith, Pteridophytes of Venezuela, an annotated list. Dept. of Botany, Univ. of California, Berkeley.

—. 1988. *Elaphoglossum*. In: J. T. Mickel & J. M. Beitel, Pteridophyte Flora of Oaxaca, Mexico. Mem. New York Bot. Gard. 46: 168–186.

—. 1990a. Three new species of *Elaphoglossum* from Peru. Amer. Fern J. 80: 110–112.

—. 1990b. Two new species of *Elaphoglossum* (Elaphoglossaceae) from Amazonas, Venezuela. Ann. Missouri Bot. Gard. 77: 594–595.

—. 1991a. *Elaphoglossum*. In: R. M. Tryon & R. G. Stolze, Pteridophyta of Peru, part IV. Fieldiana, Bot. n.s., no. 27: 110–166.

—. 1991b. Four new species of *Elaphoglossum* (Elaphoglossaceae) from Venezuela. Ann. Missouri Bot. Gard. 78: 259–261.

—. 1992. Pteridophytes. In: R. McVaugh & W. R. Anderson (editors), Flora Novo-Galicianae. Univ. of Michigan, Ann Arbor, Michigan 17: 120–431.

Smith, A. R. 1975. New species and new combinations of ferns for Chiapas, Mexico. Proc. Calif. Acad. Sci. 4th ser. 40: 209–230.